

### **REMARKS**

Applicants respectfully request reconsideration of the application, as amended, in view of the following remarks.

The present invention as set forth in **amended Claim 1** relates to a liquid crystal optical element, comprising:

a pair of substrates with transparent electrodes; and  
a liquid crystal layer having a memory property interposed between the substrates;  
a first resin layer which is provided on at least one of the transparent electrodes,  
**said first resin layer having a rubbed vertical alignment surface in contact with the liquid crystal layer.**

The importance of the rubbed vertical alignment surface of the first alignment layer is discussed at page 22 to page 24, line 22:

“In accordance with the present invention, the alignment layer of at least one of the substrates is a vertical alignment layer subjected to rubbing (hereinbelow, also referred to as RVA: Rubbed Vertical Alignment).

As a result, some of helical axes of the domains in a region of the liquid crystal in contact with the RVA are aligned by surface interaction, for example anchoring strength. Thus, coupling occurs between planar domains. There is a clear tendency for planar domains to be formed at a greater size than normal. As a result, the liquid crystal layer exhibits reflection characteristics as if the liquid crystal layer is a mirror. Thus, it becomes possible to perform display with light having high brightness.

On the other hand, when an interface obtainable by subjecting a horizontal alignment layer to a rubbing treatment is provided on one of the inner planes of the liquid crystal cell, the following situations are provided. When the liquid crystal layer is in PL, the liquid crystal layer performs display in high brightness as in the case stated earlier. When the liquid crystal layer is in FC, the alignment tends to partly returns to planar alignment. In the latter case, selective reflection by PL overlaps with scatter by FC. As a result, the contrast ratio reduces to about 50-60% in comparison with the contrast ratio in normal display with two states of PL and FC utilized therein.”

(PL-planar, FC-focal conic)

None of Tanaka et al, and JP 08-220326 disclose or suggest, alone or in combination, the liquid crystal optical element as claimed having a **first resin layer having a rubbed vertical alignment surface in contact with the liquid crystal layer**.

Tanaka et al disclose twisted nematic (TN) and super twisted nematic (STN) liquid crystal displays (LCDs) (Tanaka et al, Summary of the Invention). Alignment films made of polyimide are used (Tanaka et al, layers 2A and 2B in Figures 1 and 2 and col. 10, lines 20-29). However, there is no disclosure or suggestion of a vertical alignment layer. Tanaka et al use a slightly tilted horizontal alignment layer having a pre-tilt angle of about 1-5° (Tanaka et al, col. 11, line 39-40) and not vertical alignment layers. Thus, Claims 1 and 2 are not anticipated by Tanaka et al.

JP 08-220326 fails to cure the defects of Tanaka et al because there is no vertical alignment layer. In fact, all that this reference discloses is a color filter and not a LCD. Thus, even the combination of Tanaka et al and JP 08-220326 does not result in the claimed invention.

In addition, Applicants have added **new Claims 9-18** the limitations of which are not disclosed or suggested by Tanaka et al and JP 08-220326, alone or in combination.

Therefore, the rejection of Claims 1 and 2 under 35 U.S.C. § 102(a) over Tanaka et al (USPN 6,072,558) and the rejection of Claims 3 and 4 under 35 U.S.C. § 103(a) over Tanaka et al (USPN 6,072,558) in view of JP 08-220326 (JP'326) are believed to be unsustainable as the present invention is neither anticipated nor obvious and withdrawal of these rejections is respectfully requested.

The rejection of Claims 5 and 6 under 35 U.S.C. § 102(b) over Mukoh et al (USPN 4,278,328) and the rejection of Claims 7 and 8 under 35 U.S.C. § 103(a) over Mukoh et al (USPN 4,278,328) in view of West et al (USPN 5,453,863) and JP 08-220326 (JP'326) are respectfully traversed.

The present invention as set forth in **amended Claim 5** relates to a liquid crystal optical element, comprising:

a pair of substrates with transparent electrodes; and  
a liquid crystal layer having a memory property interposed between the substrates;  
a metal-oxide layer provided on at least one of the transparent electrodes, said metal-oxide layer being in contact with the liquid crystal layer;  
a first resin layer which is provided on at least one of the transparent electrodes,  
**said first resin layer having a rubbed vertical alignment surface in contact with the liquid crystal layer.**

None of Mukoh et al, West et al, and JP 08-220326 disclose or suggest, alone or in combination, the liquid crystal optical element as claimed having a **first resin layer having a rubbed vertical alignment surface in contact with the liquid crystal layer.**

Even though Mukoh et al disclose homeotropic alignment, the alignment layer is not a resin layer as claimed but a surfactant layer (col. 5, lines 34-48, embodiment 1 at col. 10, lines 48-53). In addition, the surfactant layers are not rubbed as currently claimed.

West et al and JP 08-220326 do not cure the defects of the primary reference. West et al disclose multistable chiral nematic displays. However, the displays use either no alignment layer (West et al, Example 1) or unrubbed polyimide (West et al, col. 7, line 4, Example 2) or other materials (West et al, col. 7, lines 1-10). However, there is no disclosure or suggestion that vertical alignment is achieved. In addition, the reference discloses that best results have been obtained using rubbed ITO without any additional surface treatments (West et al, col. 7, lines 9 and 10). Thus, this reference teaches away from using a resin layer having a rubbed vertical alignment surface as claimed in Claim 5.

JP 08-220326 also fails to disclose or suggest a resin layer having a rubbed vertical vertical alignment surface. In fact, all that this reference discloses is a color filter and not a LCD.

Thus, even the combination of Mukoh et al, West et al, and JP 08-220326 does not result in the claimed invention.

In addition, Applicants have added **new Claims 19-24** the limitations of which are not disclosed or suggested by Mukoh et al, West et al and JP 08-220326, alone or in combination.

Therefore, the rejection of Claims 5 and 6 under 35 U.S.C. § 102(b) over (USPN 4,278,328) and the rejection of Claims 7 and 8 under 35 U.S.C. § 103(a) over Mukoh et al (USPN 4,278,328) in view of West et al (USPN 5,453,863) and JP 08-220326 (JP'326) are believed to be unsustainable as the present invention is neither anticipated nor obvious and withdrawal of these rejections is respectfully requested.

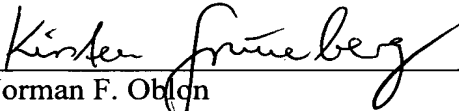
Applicants respectfully request that the Examiner acknowledge that the references cited in the **Information Disclosure Statement**, filed in the above-identified application on **April 30, 2002**, have been considered. For the Examiner's convenience a copy of Form PTO 1449 as filed on **April 30, 2002**, is attached herewith.

Application No.: 10/028,787  
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This application presents allowable subject matter, and the Examiner is kindly requested to pass it to issue. Should the Examiner have any questions regarding the claims or otherwise wish to discuss this case, he is kindly invited to contact Applicants' below-signed representative, who would be happy to provide any assistance deemed necessary in speeding this application to allowance.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,  
MAIER & NEUSTADT, P.C.



Norman F. Oblon  
Attorney of Record  
Registration No.: 24,618

Customer Number  
**22850**

Tel: (703) 413-3000  
Fax: (703) 413 -2220  
NFO:KAG:

Kirsten A. Grueneberg, Ph.D.  
Registration No.: 47,297